ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDLNN02020
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Pholisma sonorae* (Torr. ex A. Gray) Yatsk.
COMMON NAME: Sand food, sandfood, sandroot, sand-sponge, Biatatk
SYNONYMS: *Ammobroma sonorae* Torr. ex Gray
FAMILY: Lennoaceae

AUTHOR, PLACE OF PUBLICATION: *Pholisma sonorae* (Torr. ex A. Gray) Yatsk., Phytologia 52(2): 74. 1982. *Ammobroma sonorae* Torrey ex A. Gray, Mem. Am. Acad. II. 5: 327. 1854.

TYPE LOCALITY: Hills around Adair Bay, Sonora, Mexico.

TYPE SPECIMEN: HT: NY. A.B. Gray s.n., 17-19 May 1854. IT: ARIZ, NY.

TAXONOMIC UNIQUENESS: Three species within *Pholisma*; *P. arenarium*, *P. culiacana* and *P. sonorae* (Warren and Laurenzi 1987). The PLANTS database (USDA 2002) reports that the species *sonorae* is 1 of 2 species in the genus *Pholisma*, which is the only genus in the Family Lennoaceae.

DESCRIPTION: Fleshy root parasite lacking chlorophyll. The plants are grayish white and mushroom-shaped, and their height depends on the degree to which blowing sand covers the scaly stem (Armstrong 1980, in CPC 2004). Succlent stems extend 0.5–1.5 m (1.6-5.0 ft.) below the sand, 1.0-2.5 cm in diameter, and are attached to roots of nearby host plants. Each stem terminates at or near the soil surface in a single cap-like inflorescence. The scales on the stem are modified leaves. Lower scales of inflorescence (those below ground) are linear-spatulate, 1.5-2.5 cm long, glabrous, white or suffused with pale purple or violet. The upper scales (those above sand) are lanceolate, 8.0-15.0 mm long, densely puberulent with rather coarse, crisped, tawny hairs. The inflorescences form the "cap" of the mushroom-like plant protruding above the ground, 4-14 cm in diameter, bearing numerous purple flowers edged in white and arranged in a ring toward the outer edge of the cap. The central part of inflorescence is thick and somewhat concave. Each flower is sourrounded by a hairy calyx, and the masses together calyces to give the inflorescence a gray-white fuzzy appearance, while protecting plants from sun and heat (Copeland 1935, in CPC 2004). Calyx lobes 6-10 in number, narrowly linear, 7.0-9.0 mm long; corolla 8.0-9.0 mm long, tubular 5.0-5.5 mm at top of stem. Fruits are capsules, breaking up into 12-20 ovoid, laterally flattened nutlets about 1.0 mm long (similar to grains of sand) and arranged in a circle; surface of brownish nutlets finely and obscurely reticulate. (Wiggins 1980; CDC 2004; DBG 2000; Falk et al., 2001).

AIDS TO IDENTIFICATION: Flower clusters look like flat buttons or powderpuffs (12.0 cm = 5.0 in. wide) on sand. While *Pholisma sonorae* occurs on shifting white sands, *P. arenaria* can be found on more stabilized (higher vegetation density) dunes of pinkish sand nearby. Inflorescences of *P. arenaria* are markedly different than *P. sonorae*, having a narrower con-shaped "cap", and calyces with less hair. (DBG 2000). In addition, the sepals of *P. sonorae* are not plumose but glabrous. *P. sonorae* is differentiated from *Orobanche ludoviciana*, another parasitic plant, by its flat, pad-like growth form, smaller radially symmetric flowers, and light grey color of the plant (Falk, Jenkins et al. 2001).

ILLUSTRATIONS: Color photo of Holotype specimen (NYBG, accessed 2003 *in* http://http://scisun.nybg.org:8890/searchdb/owa/wwwcatalogrenz.detail_list).
Color photo of plant in habitat (Kathy Rice, accessed 2003 from http://ridgwaydb/mobot.org/cpcweb/CPC_ProfileImage.asp?FN=3407a).
Color photos (Donald Myrick 1999, *in* CalPhotos at http://elib.cs.berkeley.edu/cgi).
Color photo (R. Mitchel Beauchamp 1977, *in* CalPhotos at http://elib.cs.berkeley.edu/cgi)
Color photos of habitat and plants (Accessed 1/26/2004 from http://www.science.siu.edu/parasitic-plants/Lennoaceae/images/)
Color photo (J. Morrison, Accessed 1/26/2004 from http://www.cemml.colostate.edu/floristics/pp4.htm)
Line drawing (*in* Falk, Jenkins et al. 2001)
Color photo (J. Rorabaugh, *in* Falk, Jenkins et al. 2001)
Color photo of Habitat (Dale Turner, *in* Falk, Jenkins et al. 2001)
Line drawing (M. Kurzius, *in* Felger 2000)

TOTAL RANGE: Southwestern Arizona, southeastern California (Imperial County), Baja Norte in northwestern Sonora, Mexico, and Baja California, Mexico.

RANGE WITHIN ARIZONA: The Yuma Desert, Southern Yuma County, along the boundary with Mexico.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Perennial root parasite, dying back to undifferentiated tissue at the infection site on the host plant every year.

PHENOLOGY: Reproductive March to June, or failing to appear during drought. Each flower head produces hundreds of capsules and thousands of one-seeded nutlets, 1.0 mm or less in diameter.

BIOLOGY: Parasitic on plant roots, usually desert shrub host. Host plants do not appear to be depleted by *Pholisma* infestation, and *Pholisma* plants have been unearthed and weighed, with the weights exceeding those of the host plants (CDC 2004). Water is probably

obsorbed through the many stomata on the scale-like leaves (Yatskievych 1985, in CDC 2004). This water taken directly from the sand can then move into the host plant during times of drought stress. Therefore, the relationship between *Pholisma* and the host plant is not parasitic in the strictest sense. Dried stems may shrivel to less than 0.25% of original diameter, eventually disintegrating in sand (Armstrong 1980).

HABITAT: Drifting sandy soil and other sandy areas, in low desert below 500 ft. elevation.

ELEVATION: 1,000 ft (305 m) or less. In Arizona, based on unpublished records in the HDMS (AGFD, accessed 2004), elevation ranges from 492-1345 ft. (150-410 m).

EXPOSURE: Open.

SUBSTRATE: Sand.

PLANT COMMUNITY: Dunescrub (creosote bush scrub) in the Sonoran Desert. Host plant species include: *Ambrosia dumosa* (white bursage), *Eriogonum deserticola* (Desert Eriogonum), *Pluchea sericea* (arrow-weed), *Psorothamnus emoryi* (Emory's Psorothamnus), *Tiquilia plicata* (Fan-leaf Tiquilia), and *T. palmeri* (Palmer's Tiquilia).

POPULATION TRENDS: Per CDC (Accessed 2004), "Only two populations are known from California and Mexico. A site documented by a herbarium specimen on U.S.-Mex. Hill was visited during 1998, and no plants were located. As the site is rather remote and undeveloped, it appears that dune stabilization by associated species has sufficiently altered the habitat to the extent that Pholisma sonorae can not grow there. Two years ago, Pholisma was located near a lemon grove, at a site documented by a herbarium specimen made by Jepson. South of the U.S.-Mexican border, far more sand dune habitat can be found, but the status of the plants is unknown for that area."

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS, 1996)
[Category 2 (USDI, FWS 1993)]
[Category 2 (USDI, FWS 1990)]
[Category 3C (USDI, FWS 1985)]
[Category 3C (USDI, FWS 1983)]
[Category 1 (USDI, FWS 1980)]
[PTN-E (USDI, FWS 1976)]

STATE STATUS: Highly Safeguarded (ARS, ANPL 1999)
[Highly Safeguarded (ARS, ANPL 1993)]

OTHER STATUS: Bureau of Land Management Sensitive

(USDI, BLM AZ 2000, 2005)
Not Forest Service Sensitive (USDA, FS Region 3 1999)
[Forest Service Sensitive (USDA, FS Region 3 1990)]

MANAGEMENT FACTORS: Threats include off road vehicle use, and development such as conversion of dune habitat to housing and agricultural land. In addition, heavy equipment maneuvers within bombing and gunnery range of Luke AFB, is also a threat to their habitat.

Management needs are challenging, as dunes must remain unstabilized in order for *Pholisma* to persist. Conversion of these dunes to agricultural fields, housing developments, highways, and recreational sites is increasing, and will hasten the extinction of *Pholisma sonorae*.

PROTECTIVE MEASURES TAKEN: A small section of habitat in the Algodones dunes, in California, have been set aside for preservation to improve populations of several threatened sand dune associated plants including *Pholisma sonorae*.

SUGGESTED PROJECTS: Ongoing project involving tissue culture studies with hosts of *P. sonorae* in order to introduce parasite. Cuttings propagated at Desert Botanical Garden. Plans for 1994 were: to attempt germination in rootbound host pot; to collect seed without storing at freezing temperatures and continue correspondence with Dr. V. Pence on tissue culture work performed on *P. sonorae* and hosts at the Cincinnati Zoo and Botanical Gardens (DBG Annual Report 1993). The Desert Botanical Garden is currently processing collected seeds (from 1998 and 2000) for ongoing germination studies.

According to CDC (accessed 2004), "Since seeds do not germinate reliably, and no means of perpetuating them in cultivation has been found, the species does not lend itself readily to ex situ conservation. For this particular species, in situ conservation efforts are the key to perpetuation."

LAND MANAGEMENT/OWNERSHIP: BLM – Yuma Field Office; DOD – Barry M. Goldwater Air force Range; Private.

SOURCES OF FURTHER INFORMATION

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ADDITIONAL INFORMATION:

Historically, the stems of the plants were eaten raw or roasted by O'odham (often called "sand people") and Cocopa Native American tribes. When roasted they resemble, in flavor, well-browned yams. The stem is somewhat sweet and juicy, providing food as well as liquid for thirsty travelers. The O'odham called it "biatatk" (bia, sand or sandhills, + tatk, root).

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1998-03-16 (SSS)
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